

REMARKS

Claims 1-15 are pending with this amendment. Claims 1-9 have been amended to recite a “hydrogen permeable foil, in an amorphous state.” Support for the claim amendments can be found in the specification at, for example, p. 3, ll. 28-31; p. 5, ll. 9-14; p. 10, ll. 6, 11; p. 13, last line; and p. 14, l. 2. New claims 10-15 have been added. Support for new claims 10-15 can be found in the specification at, for example, p. 14, ll. 13-15; and p. 19, ll. 4-6. No new matter has been added.

The obviousness rejections

A. Claims 1-4, 7 and 8 have been rejected under 35 U.S.C. 103(a) as obvious over U.S. Patent No. 5,895,519 (Lorimer)

According to the Examiner, Lorimer discloses a hydrogen permeable membrane comprising a non-crystalline zirconium-nickel alloy composed of zirconium and aluminum, wherein the balance is nickel and unavoidable impurities. The Examiner acknowledges that Lorimer does not disclose the claimed atom percentages. The Examiner contends that the claims are obvious because discovering optimum or workable ranges is routine in the art.

The Applicants respectfully traverse this rejection. A “hydrogen permeable membrane” is a material that is only permeable to hydrogen, which functions as a filter to obtain high-purity hydrogen gas from a mixed-gas source. *See, e.g.,* specification at p. 1, l. 20 – p. 2, l. 9. The hydrogen permeable membrane in Lorimer is referred to as a “purifier” and is identified as “204” in Figure 2. The Lorimer purifier “can be any membrane or diffusion membrane effective for separating hydrogen gas from impurity gases, including metal diffuser separators comprising materials such as palladium and palladium alloys e.g., palladium silver or palladium-tantalum alloys.” Lorimer, col. 5, ll. 24-29. The structure identified by the Examiner as comprising a non-crystalline zirconium-nickel alloy composed of zirconium and aluminum is a “getter.” Lorimer, col. 6, ll. 12-20. A “getter” is a substance that binds gas molecules by a “sorption” process. Lorimer, col. 1, l. 65 – col. 2, l. 1. The getter is part of the storage matrix, not part of the purifier (hydrogen permeable membrane): “Storage matrix 210 preferably comprises a getter ... to abstract hydrogen, which has passed through purifier 204 ...” Lorimer, col. 6, ll. 8-12. Accordingly, Lorimer does not disclose a hydrogen permeable membrane comprising the claimed elements (e.g., nickel, aluminum,

zirconium). Accordingly, this rejection should be withdrawn because the claimed invention is not disclosed or suggested by the Lorimer reference combined with the state of the art knowledge as of the filing date.

This rejection should be withdrawn for the further reason that the claims as amended recite “hydrogen permeable foil, in an amorphous state.” Thus, the claimed composition is not merely a thin layer that can be formed on a substrate – it is the main structural unit having the function of hydrogen permeation. Lorimer does not disclose such a structure for the purifier (membrane) or the getter.

For the reasons set forth above, the applicants request that this rejection be withdrawn.

B. Claims 5, 6 and 9 have been rejected under 35 U.S.C. 103(a) as obvious over Lorimer in view of U.S. Patent No. 6,478,853 (Hara)

According to the Examiner, Lorimer discloses a hydrogen permeable membrane comprising a non-crystalline zirconium-nickel alloy composed of zirconium and niobium. The Examiner acknowledges that Lorimer does not disclose an alloy composed of zirconium, niobium, and phosphorus. The Examiner contends that Hara discloses a hydrogen permeable membrane composed of zirconium, niobium, and phosphorus. Further, the Examiner contends that the claims are obvious because discovering optimum or workable ranges is routine in the art.

Applicants respectfully traverse this rejection. Claims 5, 6, and 9 (as amended) all require that the hydrogen permeable foil include zirconium, niobium, phosphorus, and nickel. Contrary to the Examiner, Hara does not disclose a hydrogen permeable membrane composed of niobium. As stated in section A, above, Lorimer discloses membranes composed of palladium and palladium alloys, such as palladium silver or palladium-tantalum. Thus, no combination of the references discloses a membrane composed of zirconium, niobium, phosphorus, and nickel as recited in claims 5, 6, and 9. Combining the teachings of Lorimer and Hara, as they relate to hydrogen permeable membranes, would not teach a membrane that includes niobium, even less a hydrogen permeable foil, in an amorphous state. Accordingly this rejection should be withdrawn.

Conclusion

In view of the above amendments, applicant believes the pending application is in condition for allowance. If there are any remaining issues that may be addressed by an Examiner's amendment or supplemental response, the applicant respectfully requests that the Examiner contact the undersigned.

Dated: March 4, 2009

Respectfully submitted,

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